NUI Galway
OÉ Gaillimh

Semester 1 Examinations 2018 / 2019

Exam Code(s)	4BCT1, 4BP1
Exam(s)	B.Sc. Degree (Computer Science & Information Technology) Bachelor of Engineering (Electronic and Computer Engineering)
Module Code(s)	CT417
Module(s)	Software Engineering III
Paper No.	1
External Examiner(s)	Dr. Jacob Howe
Internal Examiner(s)	Prof. Michael Madden *Dr. Michael Schukat

Instructions: Answer any 3 questions.
All questions carry equal marks.

Duration	2hrs
No. of Pages	5 (including cover page)
Department(s)	Information Technology
Requirements	None

Q1. (20 marks)

(a) In Software Engineering, what is meant by the term **build**? Using a Java development environment as an example, outline what steps a **build** may include.

4 Marks

(b) Outline a set of five rules that entails best practices for using a **version control system** like Git. Two of your rules must make reference to the proper use of **tagging** and **branching**.

5 Marks

(c) What are the perceived benefits of **continuous integration**? Use the cloud-based CI tool **Shippable** as a case study to illustrate your answer.

3 Marks

(d) Distinguish between the cloud service types:

a. IaaS
b. PaaS
c. SaaS

Provide examples of typical customer needs that would be served by each of the above.

3 Marks

(e) Showing all workings, calculate the program length and vocabulary of the following code snippet:

```
int matchLocation(int[] a, int target)
{
    for(int i = 0; i  < a.length; i++)
    {
        if(a[i]==target)
            return i;
    }

    return -1;
}
```

5 Marks

PTO

Q2. (20 marks)

(a) Summarise the main features and characteristics of **Maven**. In your answer make reference to / explain the following terms:

- Project dependencies and transitive dependencies
- Plugins
- POM file
- Local and remote repositories

Use examples where appropriate.

5 Marks

(b) **Merge conflicts** are a common problem in **version control systems**. Using an example show how such conflicts may occur and how they can be resolved.

3 Marks

(c) Distinguish between the following terms used in **virtualisation**:

- Type 1 and type 2 hypervisor
- Host machine and guest machine
- Hardware virtualisation and OS-level virtualisation
- Docker

4 Marks

(d) Why did **parallel programming** become such an important area of software development in recent years? In your answer refer to and explain the following terms:

- Moore's law
- The "Hardware / software contract"
- The "power wall"
- Concurrency versus parallelism
- SMP and NUMA

5 Marks

(e) Draw the following labelled flowgraphs:

- **D_2(D_2)**
- **D_0(D_0)**

Include the corresponding pseudocode for each of the program constructs.

3 Marks

PTO

Q3. (20 marks)

(a) Describe and summarise the core components of a modern **continuous software development system** as discussed in the lectures. In your answer outline how these components interact, and how they are inter-linked.

4 Marks

(b) Assume you want to retrofit version control via **Git** on a Java development project of yours that is stored on your local PC. Summarise the sequence of steps (i.e. Git commands) required to create a local repository and to manage your project files. In your answer explain how files can be excluded from version management and how versioning and roll-back can be achieved.

4 Marks

(c) Explain the following terms used in **virtualisation**:

a. Para-virtualisation
b. Virtual appliances
c. Live migration (and its inner workings)
d. Hardware virtualisation and OS-level virtualisation

4 Marks

(d) Using code snippets and / or diagrams explain the following terms used in **parallel programming**:

a. Race condition
b. The fork / join model
c. SMT
d. Fine-grained parallelism versus coarse-grained parallelism
e. Schedules and chunks

5 Marks

(e) Describe, using examples, the following **object-oriented measures**:

a. Number of operations overridden
b. Depth of inheritance
c. Coupling between objects

3 Marks

PTO

Q4. (20 marks)

(a) Differentiate between **centralised version control systems** and **distributed version control systems**. In your answer highlight similarities, differences, advantages and limitations of both concepts.

4 Marks

(b) Provide explanations / definitions for the following **Extreme Programming Practices**:

- Test-driven development
- Metaphor
- Collective ownership
- Pair programming
- Planning game

5 Marks

(c) Using diagrams distinguish between the following **networking options** as supported by Oracle VirtualBox:

- NAT
- Bridged adapter
- NAT network

3 Marks

(d) The **scheduling of parallel loops** is an important element of OpenMP. Summarise characteristics, similarities and differences between the following OpenMP schedules:

- Static
- Interleaved
- Dynamic
- Guided

6 Marks

(e) What is meant by the *Halstead Complexity Measure* (HCM)?

2 Marks